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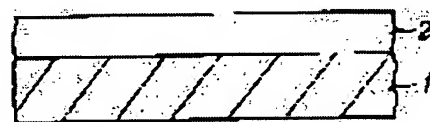
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(54) INFORMATION RECORDING MEDIUM

(57)Abstract:

PURPOSE: To provide an information recording medium which is capable of compositely recording both magnetic recording information and visual information constituted of a hologram or a diffraction grid and of effectively preventing forgery and alternation and is excellent in security.

CONSTITUTION: An information recording medium is constituted of a magnetic recording layer 2. The magnetic recording layer is constituted of a hologram or a diffraction grid. Further the information recording medium is equipped with a hologram forming layer or a diffraction grid forming layer on the magnetic recording layer.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Industrial Application] Especially this invention relates to the information record medium which can perform two or more kinds of information records into a single medium by using the magnetic-recording layer itself as a hologram or a diffraction-grating layer, or having the hologram formative layer or the diffraction-grating formative layer on a magnetic-recording layer about an information record medium.

[Description of the Prior Art] The magnetic-recording medium by which it comes to form a magnetic-recording layer in the front face of a plastics base material has spread widely as a credit card, an ID card, a commuter pass, a magnetic tape, etc. Such a magnetic-recording medium has the advantage that the recording density is high and moreover cannot read recording information easily from the exterior.

[Problem(s) to be Solved by the Invention] The actual condition is that, as for the conventional magnetic-recording medium, ** does not possess the sufficiently effective prevention means in the point of this forged prevention with the spread of magnetic cards in recent years, its alteration and forgery serving as a social problem. This invention is made in view of the point mentioned above, and has the following objects.

- (1) Offer the information record medium which can record complexly the both sides of magnetic-recording information and the visible information which consists of a hologram.
- (2) Offer the information record medium which is effective in prevention of forgery and alteration, and was excellent in security nature.

[Means for Solving the Problem] The information record medium by this invention makes it a basic feature it to be possible to record two or more kinds of information on the same information record medium, and to have excelled also in prevention of forgery and alteration further using a magnetic-recording layer as a hologram layer or a diffraction-grating layer simultaneously, or by having the hologram formative layer or the diffraction-grating formative layer on a magnetic-recording layer. Hereafter, this invention is explained based on the desirable example shown in an accompanying drawing. Drawing 1 is the sectional view showing the fundamental configuration of the information record medium by this invention. As shown in this Fig., as for the information record medium by this invention, it comes to form the magnetic-recording layer 2 on a base material 1. This magnetic-recording layer 2 serves both as the hologram layer 2 or the diffraction-grating layer 2 as a visible information layer simultaneously. Drawing 2 is the sectional view of other embodiments of this invention, and the hologram layer 2 or the diffraction-grating layer 2 which served as the magnetic-recording layer formed on the base material 1 in this case is constituted by hologram formative layer 3a or diffraction-grating formative layer 3a, and thin film layer 3b. Furthermore, the protective layer 4 is formed in the front face of the hologram layer 2 or the diffraction-grating layer 2. Drawing 3 is the sectional view of other embodiments of this invention, and the hologram formative layer 14 or the diffraction-grating formative layer 14 is formed through the thin film layer 13 on the magnetic-recording layer 12 formed on the base material 11 in this case. And the protective layer 15 is formed on this hologram formative layer 14 or the diffraction-grating formative layer 14. first, base materials 1 and 11 consist of the shape of a sheet, the shape of a film, and tabular construction material, are not restricted especially as an ingredient, and are independent in metals, such as plastics, such as polyethylene terephthalate (PET), nylon, cellulose diacetate, polystyrene, polyethylene,

polypropylene, polyester, polyimide, and a polycarbonate, copper, and aluminum, paper, an impregnated paper, etc. -- or it can combine and use. About 0.005-5mm is suitable for the thickness of a base material. As a magnetic material contained in the magnetic-recording layer 2 which served as the hologram formative layer, or the magnetic-recording layer 12, an inorganic magnetism particle with conventionally well-known gamma-Fe₂O₃, Fe₃O₄, CrO₂, Fe, Fe-Cr, Fe-Co, Co-Cr, Co-nickel, MnAl, Ba ferrite, Sr ferrite, etc., a macromolecule magnetic material, an organic magnetic material, etc. may be used. the formation approach as a magnetic-recording layer -- (b) -- these magnetic materials are kneaded to a resin binder, and there is the thin film forming method by the (b) vacuum deposition method, the sputtering method, plating, etc. In (b), in the magnetic-recording layer 2, especially the magnetic-recording layer 2 turns into the hologram formative layer or the diffraction-grating formative layer, and, in (b), it becomes a hologram reflecting layer or a diffraction-grating reflecting layer. As a formation ingredient of the hologram formative layer or the diffraction-grating formative layer A polyvinyl chloride, an acrylic like a methylmethacrylate, polystyrene, Thermoplastics, such as a polycarbonate, unsaturated polyester, a melamine, Epoxy, polyester (meta) acrylate, urethane (meta) acrylate, Epoxy (meta) acrylate, polyether (meta) acrylate, The mixture of the thing which stiffened thermosetting resin, such as polyol (meta) acrylate, melamine (meta) acrylate, and triazine system acrylate, or the above-mentioned thermoplastics, and thermosetting resin can be mentioned. Furthermore, the thermoforming nature matter which has a radical polymerization nature partial saturation radical is usable as a formation ingredient of the hologram formative layer or diffraction lattice type stratification, and there are two sorts of following things in this.

(1) What has a radical polymerization nature partial saturation radical in the polymer whose glass transition point is 0-250 degrees C. What introduced the radical polymerization nature partial saturation radical by approach (b) which more specifically mentions later the compound shown in following ** - ** to a polymerization or the polymer which carried out copolymerization - (d) can be mentioned.

** The monomer which has a hydroxyl group : N-methylol acrylamide, 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, 2-hydroxypropyl acrylate, 2-hydroxypropyl methacrylate, 2-hydroxy butyl acrylate, 2-hydroxy butyl methacrylate, 2-hydroxy-3-phenoxy propyl methacrylate, 2-hydroxy-3-phenoxypropylacrylate, etc.

** The monomer which has a carboxyl group : an acrylic acid, a methacrylic acid, acryloyloxyethyl mono-succinate, etc.

** The monomer which has an epoxy group : glycidyl methacrylate etc.

** The monomer which has an aziridinyl radical : 2-aziridinyl ethyl methacrylate, 2-aziridinyl propionic-acid allyl compound, etc.

** The monomer which has an amide group : acrylamide, methacrylamide, diacetone acrylamide, dimethylaminoethyl methacrylate, diethylamino ethyl methacrylate, etc.

** The monomer which has a sulfone radical : 2-acrylamide-isobutane sulfonic acid etc.

** The monomer which has an isocyanate radical : 2 and 4-toluene diisocyanate, diisocyanate, such as an one mol addition product of one-mol pairs of 2-hydroxyethyl acrylate, the addition product of the radical polymerization monomer which has active hydrogen, etc.

** In order to adjust the glass transition point of the above-mentioned copolymer or to adjust the physical properties of the hardening film, copolymerization can be carried out to the above-mentioned compound, this compound, and the following monomers that can be copolymerized. As a monomer which can be copolymerized, methyl methacrylate, methyl acrylate, ethyl methacrylate, ethyl acrylate, propyl methacrylate, propylacrylate, butyl methacrylate, butyl acrylate, isobutyl methacrylate, isobutyl acrylate, t-butyl methacrylate, t-butyl acrylate, isoamyl methacrylate, isoamyl acrylate, cyclohexyl methacrylate, cyclohexyl acrylate, 2-ethylhexyl methacrylate, 2-ethylhexyl acrylate, etc. are mentioned.

Next, diffraction-grating formation resin or hologram formation resin can be obtained by making the polymer obtained as mentioned above react by approach (b) described below - (d), and introducing a radical polymerization nature partial saturation radical.

(**) In the case of the polymer of the monomer which has a hydroxyl group, or a copolymer, carry out the condensation reaction of the monomer which has carboxyl groups, such as an acrylic acid

and a methacrylic acid.

(**) In the case of the polymer of the monomer which has a carboxyl group and a sulfone radical, or a copolymer, carry out the condensation reaction of the monomer which has the above-mentioned hydroxyl group.

(**) In the case of the polymer of the monomer which has an epoxy group, an isocyanate radical, or an aziridinyl radical, or a copolymer, carry out the addition reaction of the monomer which has the monomer which has the above-mentioned hydroxyl group, or a carboxyl group.

(**) In the case of the polymer of the monomer which has a hydroxyl group or a carboxyl group, or a copolymer, carry out the addition reaction of the 1 to 1-mol addition product of a monomer, and a diisocyanate compound and a hydroxyl-group content acrylic ester monomer which has the monomer or aziridinyl radical which has an epoxy group.

In order to perform the above-mentioned reaction, it is desirable to add polymerization retarders, such as hydroquinone of a minute amount, and to perform dry air with delivery.

(2) The compound which the melting point is 0-250 degrees C, and has a radical polymerization nature partial saturation radical. Specifically, stearylacrylate, stearyl methacrylate, thoria krill isocyanurate, cyclohexane diol diacrylate, cyclohexane diol dimethacrylate, spiroglycol diacrylate, spiroglycol dimethacrylate, etc. are mentioned.

Moreover, the above (1) and (2) can also be mixed and used as hologram formation resin in this invention, and a radical polymerization nature partial saturation monomer can also be further added to them. This radical polymerization nature partial saturation monomer raises crosslinking density in the case of an ionizing-radiation exposure. It is what raises thermal resistance. Besides an above-mentioned monomer Ethylene glycol diacrylate, Ethylene glycol dimethacrylate, polyethylene-glycol diacrylate, Polyethylene glycol dimethacrylate, hexanediol diacrylate, Hexanedioldimethacrylate, trimethylolpropane triacrylate, Trimethylolpropanetrimethacrylate, trimethylol propane diacrylate, Trimethylol propane dimethacrylate, pentaerythritol tetraacrylate, Pentaerythritol tetra-methacrylate, a pentaerythritol thoria chestnut rate, Pentaerythritol trimethacrylate, dipentaerythritol hexaacrylate, Dipentaerythritol hexamethacrylate, ethylene-glycol-diglycidyl-ether diacrylate, Ethylene-glycol-diglycidyl-ether dimethacrylate, polyethylene-glycol-diglycidyl-ether diacrylate, Polyethylene-glycol-diglycidyl-ether dimethacrylate, propylene glycol diglycidyl ether diacrylate, Propylene glycol diglycidyl ether dimethacrylate, polypropylene-glycol-diglycidyl-ether diacrylate, Polypropylene-glycol-diglycidyl-ether dimethacrylate, sorbitol tetraglycidyl ether tetraacrylate, sorbitol tetraglycidyl ether tetra-methacrylate, etc. can be used. As for such a monomer, it is desirable to use at a rate of the 0.1 - 100 weight section to the solid content 100 weight section of the above-mentioned copolymer mixture. Moreover, although the above-mentioned thing can fully be hardened with an electron ray, when making it harden by UV irradiation, what generates a radical as a sensitizer by UV irradiation, such as benzoin ether, such as a benzoquinone, a benzoin, and benzoin methyl ether, halogenation acetophenones, and beer chills, can be used. When a magnetic-recording layer is the hologram formative layer or the diffraction-grating formative layer as are mentioned above, and this invention is shown in drawing 1 $R > 1$ and drawing 2, as for a magnetic-recording layer, it is important to have sufficient plasticity to be able to form the shape of a concavo-convex pattern like a relief hologram and a relief diffraction grating in the front face, and it is necessary to care about the class of resin binder to a magnetic material, an amount, and the particle diameter of a magnetic material for that purpose. When making a binder construct a bridge, using resin with small molecular weight, using thermoplastics, specifically, the resin of crosslinking density which becomes low is used. Or the device of adding a plasticizer again is required. Moreover, it is also required to choose combination of the ingredient which can graduate the front face of a layer. 20% - 50% of the amount of the resin binder to a magnetic material is desirable. Moreover, it is desirable to take into consideration from the pitch and the depth of a concavo-convex pattern, and to set preferably 0.01-3 micrometers of particle diameter of a magnetic material to 0.1-0.8 micrometers. It can do [considering as the magnetic layer which a concavo-convex pattern tends to form by carrying out like this, or]. However, in any case, it is necessary to choose in consideration of the dispersibility of the magnetic material to be used, the physical properties of a magnetic material paint film, magnetic properties, etc. In this invention, any of a plane hologram and a volume hologram are sufficient as the hologram formative layer, in the case of a plane hologram, a

relief hologram is desirable from a field with mass production nature, endurance, and cost, and, in the case of a volume hologram, an Lippman-type hologram is desirable from the field of image repeatability and mass production nature. In addition, white light playback holograms, such as laser playback holograms, such as full NERUHOROGURAMU, a fraunhofer hologram, a lens loess Fourier transform hologram, and an image hologram, and a rainbow hologram, the color hologram which used those principles further, a computer hologram, a hologram display, a multiplexer hologram, a holographic stereogram, a holographic diffraction grating, etc. can be used. Although said holographic diffraction grating using a hologram record means can also constitute a diffraction-grating layer, it can create the diffraction grating from which the diffracted light of arbitration is obtained based on count by creating a diffraction grating mechanically using electron-beam-lithography equipment etc. As the sensitive material for diffraction-grating formation for recording an interference fringe, or a sensitive material for hologram formation, silver salt, dichromated gelatin, thermo plastics, diazo *****, a photoresist, a ferroelectric, a photochromics ingredient, a thermostat clo mix ingredient, chalcogens glass, etc. can be used. And the hologram formative layer can be conventionally formed by the well-known approach. For example, when a hologram is a relief hologram, an interference fringe can lay the resin sheet for hologram formation on this hologram original edition, can carry out the heating pressure welding of both with the means of a heating roller etc., using the hologram original edition recorded in the concavo-convex form as a press die, and can obtain the hologram layer 4 which has a relief forming face by the approach of reproducing the concavo-convex pattern of the hologram original edition on the resin sheet front face for hologram formation. When a hologram is a volume hologram, winding reproduction can be carried out by carrying out coating formation of the photopolymer etc. on a base material, piling up with the hologram original edition currently created beforehand, and irradiating a laser slit-like light. Then, heat developing etc. may be processed. Anyway, many duplicate versions can be prepared, it can consider as a random pattern, or many things can be devised so that each record object can hold the reconstruction image according to individual as much as possible. When the metal thin film which reflects light as thin film layer 3b or a thin film layer 13 in using a hologram or a diffraction grating as a reflective mold is used and it uses a hologram or a diffraction grating as a transparence mold, they are the hologram formative layer or the diffraction-grating formative layer, and an association. The ***** hologram effectiveness or the diffraction effect is discovered. Specifically as a metal thin film which is used in the case of a reflective mold hologram or a reflective mold diffraction grating, it consists of an alloy of compounds, such as metals, such as aluminum, Cr, Cu, nickel, Sn, Zn, Te, In, Bi, Pb, Co, Ag, Mg, Sb, Cd, Se, Ga, and Rb, and an oxide of those, and a nitride, or these metals. aluminum, Cr, Cu, nickel, Ag, Au, etc. may be especially used preferably among the above-mentioned metal components. By approaches, such as a vacuum deposition method, a spatter, and plating, this reflecting layer (when a reflecting layer is a metal thin film, you may serve both as a sensible-heat destructive printing layer or a discharge-breakdown printing layer) can be formed in it, as the irregularity of the hologram formative layers 3a and 14 is followed. 10A - 1 micrometer of thickness of a reflecting layer is about 200-2000A still more preferably. When a hologram or a diffraction grating is a transparence mold hologram or a transparence mold diffraction grating, a reflexivity metal thin film layer 200A or less is mentioned for the transparent material and thickness in which a refractive index differs from adjoining layers, such as a protective layer, the hologram formative layer, or the diffraction-grating formative layer, that what is necessary is just the construction material which does not conceal the coloring layer or pattern on a magnetic-recording layer which is mentioned later. In the case of the former, the refractive index of a transparent material may be larger than the adjoining layer, or may be small, but the difference of a refractive index is 0.5 or more preferably 0.1 or more, and, as for the value of a refractive index, it is desirable that it is 1.0 or more. Thus, by preparing the transparence thin film layer from which a refractive index differs, diffraction or the hologram effectiveness can be discovered and, moreover, the operation which does not make lower layer coloring or a pattern conceal is acquired. Moreover, in the case of the latter, it is a reflexivity metal thin film, but since thickness is 200A or less, the permeability of a light wave is large, therefore demonstrates display a non-concealing operation with diffraction or a manifestation operation of the hologram effectiveness. That is, when a light wave passes through the inside of a reflexivity metal thin film, in order that the amplitude may decrease

rapidly per wave and by exp ($-2\pi iK$), permeability will become quite small if the thickness exceeds 200Å. Therefore, permeability can become sufficient thing and can make diffraction or the hologram effectiveness discover by making thickness into 200Å or less. moreover, the exterior sense of incongruity by the silver white of the high brightness seen conventionally is also canceled by making thickness into 200Å or less. The ingredient of following (1) - (6) is mentioned as an ingredient used for formation of the above thin film layers 3b and 13.

(1) a transparence continuation thin film with a larger refractive index than a diffraction-grating layer or a hologram layer -- there are a transparent thing and what is transparent in infrared rays or an ultraviolet region in this in a visible region, the former is shown in a table 1 and the latter is shown in a table 2, respectively. n shows a refractive index among a table ((2) also setting to - (6) hereafter the same).

[A table 1]

表 1

材 質	n	材 質	n
Sb ₂ S ₃	3.0	SiO	2.0
Fe ₂ O ₃	2.7	In ₂ O ₃	2.0
PbO	2.6	Y ₂ O ₅	1.9
ZnSe	2.6	TiO	1.9
CdS	2.6	ThO ₂	1.9
Bi ₂ O ₃	2.4	Si ₂ O ₃	1.9
TiO ₂	2.3	PbF ₂	1.8
PbCl ₂	2.3	Cd ₂ O ₃	1.8
CeO ₂	2.2	La ₂ O ₃	1.8
Ta ₂ O ₅	2.2	MgO	1.7
ZnS	2.1	Al ₂ O ₃	1.6
ZnO	2.1	LaF ₃	1.6
CdO	2.1	CaO · SiO ₂	1.6
Nd ₂ O ₃	2.0	CeF ₃	1.6
Sb ₂ O ₃	2.0	NdF ₃	1.6
ZrO ₂	2.0	SiO ₂	1.5
WO ₃	2.0	SiO ₃	1.5
Pr ₆ O ₁₁	2.0	ThF ₄	1.5

[A table 2]

表 2

材 質	n
C d S e	3. 5
C d T e	2. 6
G e	4. 0 ~ 4. 4
H f O ₂	2. 2
P b T e	5. 6
S i	3. 4
T e	4. 9
T l C l	2. 6
Z n T e	2. 8

(2) The example of the transparence ferroelectric of the transparence ferroelectric above with a larger refractive index than a diffraction-grating layer or a hologram layer is shown in a table 3.
[A table 3]

表 3

材 質	n
CuCl	2. 0
CuBr	2. 2
GaAs	3. 3~3. 6
GaP	3. 3~3. 5
N ₄ (CH ₂) ₆	1. 6
Bi ₄ (GeO ₄) ₃	2. 1
KH ₂ PO ₄ (KDP)	1. 5
KD ₂ PO ₄	1. 5
NH ₄ H ₂ PO ₄	1. 5
KH ₂ AsO ₄	1. 6
RbH ₂ AsO ₄	1. 6
KTa _{0.65} Nb _{0.35} O ₃	2. 3
K _{0.6} Li _{0.4} NbO ₃	2. 3
KSr ₂ Nb ₅ O ₁₅	2. 3
Sr _x Ba _{1-x} Nb ₂ O ₆	2. 3
Ba ₂ NaNbO ₁₅	2. 3
LiNbO ₃	2. 3
LiTaO ₃	2. 2
BaTiO ₃	2. 4
SrTiO ₃	2. 4
KTaO ₃	2. 2

(3) The example of the transparence continuation thin film of the transparence continuation thin film above with a refractive index smaller than a diffraction-grating layer or a hologram layer is shown in a table 4.

[A table 4] 表 4

材 質	n
LiF	1. 4
MgF ₂	1. 4
3NaF · AlF ₃	1. 4
AlF ₃	1. 4
GaF ₂	1. 3
NaF	1. 3

(4) A reflexivity metal thin film reflexivity metal thin film with a thickness of 200Å or less has complex index of refraction, and this complex-index-of-refraction n^* is expressed with $n^*=n-iK$. Here, n shows a refractive index and K shows an absorption coefficient. The construction material of the reflexivity metal thin film which can be used for this invention is shown in a table 5, and the above-mentioned value of n and K is shown collectively.

[A table 5]

表 5

材 質	n	K
B e	2. 7	0. 9
M g	0. 6	6. 1
C a	0. 3	8. 1
S r	0. 6	3. 2
R a	0. 9	1. 7
L a	1. 8	1. 9
C e	1. 7	1. 4
C r	3. 3	1. 3
M n	2. 5	1. 3
C u	0. 7	2. 4
A g	0. 1	3. 3
A u	0. 3	2. 4
A l	0. 8	5. 3
S b	3. 0	1. 6
P d	1. 9	1. 3
N i	1. 8	1. 8

Moreover, metals other than the construction material mentioned to the above-mentioned table 5, such as Sn, In, Te, Ti, Fe, Co, Zn, germanium, Pb, Cd, Bi, Se, Ga, and Rb, are usable. Furthermore, the oxide of the above-mentioned metal, a nitride, etc. are usable, and a metal, its oxide, a nitride, etc. can also be used independently, or may be used combining two or more sorts.

(5) A large thing, a small thing, and any are sufficient as a refractive index to the resin diffraction-grating layer or hologram layer from which a diffraction-grating layer or a hologram layer, and a refractive index differ. These examples are shown in a table 6.

[A table 6]

表 6

樹 脂	n
ポリテトラフルオルエチレン	1. 3 5
ポリクロルトリフルオルエチレン	1. 4 3
酢酸ビニル樹脂	1. 4 5 ~ 1. 4 7
ポリエチレン	1. 5 0 ~ 1. 5 4
ポリプロピレン	1. 4 9
メチルメタクリレート樹脂	1. 4 9
ナイロン	1. 5 3
ポリスチレン	1. 6 0
ポリ塩化ビニリデン	1. 6 0 ~ 1. 6 3
ビニルブテラール樹脂	1. 4 8
ビニルホルマール樹脂	1. 5 0
ポリ塩化ビニル	1. 5 2 ~ 1. 5 5
ポリエステル樹脂	1. 5 2 ~ 1. 5 7
石炭酸ホルマリン樹脂	1. 5 ~ 1. 7

Moreover, although the common synthetic resin besides the resin mentioned to the above-mentioned table 6 is usable, resin with the especially large difference of a refractive index with a diffraction-grating layer or a hologram layer is desirable.

(6) The combination of the construction material of above-mentioned (1)(1) of the layered product above which comes suitably to combine construction material shown in - (5) - (5) is arbitrary, and can also choose the vertical physical relationship of each class in lamination as arbitration. The thickness of the thin film layer of (4) has desirable 200A or less among the thin film layers of above-mentioned (1) - (6). The thickness of the thin film layer of (1) - (3) and (5), and (6) A thin film layer can set up suitably according to the construction material to be used that what is necessary is just the range which can maintain transparency, and, generally is about 100-5000A preferably about 10-10000A. As an approach of forming a thin film layer using construction material as shown in above-mentioned (1) - (4), common thin film means forming, such as vacuum evaporation technique, the sputtering method, a reactive sputtering method, the ion plating method, and electric plating, can be used. Moreover, when forming a thin film layer using construction material as shown in above (5), the general coating approach etc. can be used. Furthermore, when forming a thin film layer using construction material as shown in above (6), it can use, combining each above-mentioned means, an approach, etc. suitably. In addition, when using construction material as shown in above (5), as long as it is a transparent material, you may not be a thin film, and 0.5 micrometers or more of resin layers which have the thickness of 1.0-3.0 micrometers preferably may be formed. That it is a laminating with a magnetic-recording layer enables it to distinguish at a glance by considering as a transparence mold especially. In the case of this invention, generally, hologram formation layer thickness has desirable 100-800A. Embossing nature falls remarkably that a reflection effect is scarce in it being 100A or less, and it is 800A or more. Protective layers 4 and 15 are formed for the purpose of protection of a recording layer, in order to secure the physical property of a record medium, and endurance. Formation of protective layers 4 and 15 can be performed by laminating a synthetic-resin film, being based on the extrusion coat method, or applying synthetic coating material. It may be the same as that of the synthetic resins used by facing for forming an above-mentioned coloring layer as resin which constitutes a protective layer in consideration of endurance,

adhesion with the layer of heat-resistant or others, etc., and the resin of the high ultraviolet rays and electron ray hardening mold of a physical characteristic is more desirable. As ionizing-radiation hardenability resin for protection stratification, the mixed resin constituent by the prepolymer which has a weight nature unsaturated bond or an epoxy group in a molecule, oligomer, a monomer, etc. is used. In addition, the above-mentioned prepolymer and the example of oligomer begin the unsaturated polyester by the condensate of partial saturation dicarboxylic acid and polyhydric alcohol etc., and acrylate, such as methacrylate, such as polyester methacrylate, polyether methacrylate, polyol methacrylate, and melamine methacrylate, polyester acrylate, epoxy acrylate, urethane acrylate, polyether acrylate, polyol acrylate, and melamine acrylate, is mentioned. Furthermore, the styrene monomer according [the example of a monomer] to styrene, alpha, methyl styrene, etc., A methyl acrylate, 2-ethylhexyl acrylate, acrylic-acid methoxy ethyl, Acrylic-acid butoxy ethyl, butyl acrylate, acrylic-acid methoxy butyl, Acrylic ester, such as acrylic-acid phenyl, a methyl methacrylate, Ethyl methacrylate, methacrylic-acid propyl, methacrylic-acid methoxy ethyl, Methacrylic ester, such as methacrylic-acid ethoxy methyl and methacrylic-acid phenyl Acrylic-acid-2-(N and N-diethylamino) ethyl, methacrylic-acid-2-(N and N-dimethylamino) ethyl, Acrylic-acid-2-(N and N-dibenzylamino) ethyl, methacrylic-acid-2-(N and N-dimethylamino) methyl, The permutation amino alcohol ester of partial saturation acids, such as acrylic-acid-2-(N and N-diethylamino) propyl Unsaturated-carboxylic-acid amides, such as acrylamide and methacrylamide, ethylene glycol diacrylate, Propylene glycol diacrylate, neopentyl glycol diacrylate, 1,6-hexanediol diacrylate, diethylene glycol diacrylate, Diacrylate compounds, such as triethylene glycol diacrylate, Dipropylene glycol diacrylate, ethylene glycol acrylate, Polyfunctional compounds, such as propylene glycol dimethacrylate and diethylene-glycol dimethacrylate, The Pori thiol compounds which have two or more thiol groups in molecules, such as trimethylol propane TORICHIO glycolate, a trimethylol propane TORICHIOPUROPI rate, and a pentaerythritol tetra-thioglycol, are used. When forming a protective layer with the above ionizing-radiation hardening mold resin, in consideration of the coating fitness of the coating agent by ionizing-radiation hardening mold resin, the mixed constituent of a monomer and/or an above-mentioned prepolymer or 5 - 95% of the weight of oligomer, and 95 - 5% of the weight of the Pori thiol compounds is usually used. Moreover, in the coating agent by ionizing-radiation hardening mold resin, when this coating agent is hardened by the exposure of ultraviolet rays, of course, photosensitizers, such as n butylamine, triethylamine, and tri-n-butyl phosphine, may be added [the photopolymerization initiator by acetophenones, benzophenones, MIHIRA benzoyl benzoate alpha and AMIROKI SIMM ester, tetramethyl MEURAMU monosulfide, and thioxan tons and] if needed. The coating approach of the coating agent at the time of forming a protective layer can use well-known approaches, such as a roll coat, curtain flow coat, wire bar coat, reverse coat, gravure coat, gravure reverse coat, air knife coat, kiss coat, blade coat, smooth coat, and comma coat. Moreover, in hardening in the protection stratification by ionizing-radiation hardening mold resin, they are an ultrahigh pressure mercury lamp, a high-pressure mercury-vapor lamp, a low pressure mercury lamp, and car BONA. it is based on various electron ray accelerators, such as the UV irradiation from the light source of KU, a black light lamp, a metal halide lamp, etc. or a cock loft WARUTON mold, a handicap graph mold, a resonance transformer mold, an insulating core transformer mold, a linear model, the Dynamitron mold, and a RF mold, -- the electron beam irradiation of the energy of 100-300keV is used preferably 100 to 1000 keV. in order [in addition,] to raise endurance and thermal resistance to a protective layer -- fine particles, such as Teflon powder, -- softening temperature is 100 degrees C or more preferably, and the pulverized coal of submicron extent may contain [particle size with high transparency] in several micrometers and **. Moreover, into a protective layer, silicone, polyethylene wax, etc. may be added and detachability may be given on a front face. In addition, in this invention, as shown in the magnetic-recording layer top of a magnetic-recording medium, or drawing 4 - drawing 6 , the coloring layer and pattern for giving the concealment / ornament effectiveness may be prepared. The magnetic-recording medium shown in drawing 4 has the transparence mold hologram which consists of a thin film layer 13 which consists of an above-mentioned transparent material which has the refractive index of the ingredient which constitutes the hologram formative layer 14 recorded by the method of a relief hologram, and the hologram formative layer 14, and a different refractive index. And the pattern 17 is formed while the adhesives

layer 16 exists between the magnetic-recording layer 12 and the thin film layer 13. As shown in drawing, even if the pattern 17 is in contact with the magnetic-recording layer 12, it may be in contact with the thin film layer 13, and may be in the adhesives layer 16 further. Thus, a pattern 17 can be observed, without a pattern's 17 being concealed by the hologram reconstruction image, if a pattern 17 is formed in the bottom of the thin film layer 13 and a magnetic-recording medium will be observed by the angular dependence to the illumination light and observer of a hologram from the include angle a hologram reconstruction image is in sight, and being concealed by the hologram reconstruction image if it observes from said include angle and a different include angle. In the example shown in drawing 5, the coloring layer 18 is formed between the hologram formative layers 14 and the magnetic-recording layers 12 which were recorded by the method of the Lippman-type hologram whose magnetic-recording medium is a volume hologram. The hologram formative layer 14 which consists of an Lippman-type hologram is substantially transparent, and it is desirable to constitute the coloring layer 18 from a point of concealing the point and magnetic-recording layer of conspicuousness of a hologram reconstruction image, with a dark-colored coloring coating. Moreover, since the Lippman-type hologram has the wavelength selectivity of reflective playback light, when the coloring layer 18 is constituted from a coloring coating with different reflected wave length from the wavelength of reflective playback light or using the coloring coating which has the relation of the color and the complementary color of a hologram reconstruction image by reflective playback light takes fanciness into consideration, it is desirable. In addition, a coloring coating is mixed in adhesives and the effectiveness same also as coloring adhesives is acquired. In the example shown in drawing 6, when a magnetic-recording medium draws mechanically with electron-beam-lithography equipment, the pattern 17 is formed between the thin film layers 13 on the diffraction-grating layer 14 on which the diffraction grating was recorded which consist of a diffraction-grating layer 14 and a reflexivity metal. Thus, if the pattern layer 17 is formed on the thin film layer 13, a pattern 17 is always observable by making into a background light reflected in the thin film layer 13. Moreover, in forming a pattern 17 on the diffraction-grating layer 14, in order to prevent the scan of the magnetic head at the time of a store and reading etc. wearing and being alike, and a pattern 17 disappearing more, it is desirable to form the protective layer 15 which was mentioned above. A coloring layer and a pattern Ethyl cellulose, a cellulose nitrate, ethyl hydroxyethyl cellulose, Cellulosics, such as cellulose acetate propionate and cellulose acetate, Styrene resin, such as polystyrene and Polly alpha methyl styrene, or styrene copolymerization resin, A polymethyl methacrylate, polymethacrylic acid ethyl, polyacrylic acid ethyl, Acrylic resin, such as polyacrylic acid butyl, or independent or copolymerization resin of methacrylic resin, Rosin ester resin, such as rosin, rosin denaturation maleic resin, rosin denaturation phenol resin, and polymerization rosin, Polyvinyl acetate resin, cumarone resin, vinyltoluene resin, vinyl chloride resin, To binders, such as polyester resin, polyurethane resin, and butyral resin Various kinds of pigments are added according to the color which should be colored, and the need is accepted further. A plasticizer, A stabilizer, a wax, grease, a drying agent, a desiccation adjuvant, a curing agent, a thickener, After adding a dispersant, it can form in a request part using the coloring coating or ink which it fully comes to knead by the method of application or the printing approaches, such as the usual gravure method, the rolling method, the knife-edge method, and an offset method, by the solvent or the diluent. In this invention of the above-mentioned mode, while recording magnetic-recording information on said magnetic-recording layer, it is possible to record in piles the visible information which used the holography technique for the hologram formed in this layer or the layer by which the laminating is carried out as the hologram formative layer. Thus, since the information from which two kinds of record means differ in this invention is complexly recordable, formation of magnetic information, a hologram, or a diffraction-grating pattern is possible, therefore forgery and alteration are prevented upwards in a single record medium, and it is effective for it. That is, since the hologram layer or the diffraction-grating layer, and the magnetic-recording layer are formed in the same medium in this invention, two kinds which are characteristic, respectively of different information on the rewritable un-visual information by magnetic recording is further recordable into the same medium with a hologram or the design nature of a diffraction grating, and security nature.

[Effect of the Invention] In the information record medium in this invention, since the magnetic-recording layer, the hologram layer, or the diffraction-grating layer constitutes the same layer, the

following effectiveness is done so.

(1) Two kinds of information on magnetic-recording information, a hologram, or diffraction-grating information is complexly recordable.

(2) In prevention of forgery and alteration, it is effective, and excel in security nature.

(3) Since lamination can be simplified, it becomes possible to constitute the thickness of a record medium thinly.

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] The information record medium which is an information record medium which comes to have a magnetic-recording layer, and is characterized by for said magnetic-recording layer consisting of a hologram or a diffraction-grating layer, or having the hologram formative layer or the diffraction-grating formative layer on said magnetic-recording layer.

[Claim 2] The information record medium according to claim 1 which the front face of a magnetic-recording layer is formed in the shape of [like a relief hologram and a relief diffraction grating] a concavo-convex pattern, is used as the hologram formative layer or the diffraction-grating formative layer, and is characterized by coming to form a thin film layer in the concavo-convex side further.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the fundamental configuration of the information record medium by this invention.

[Drawing 2] It is the sectional view showing an example of the concrete configuration of the information record medium by this invention.

[Drawing 3] It is the sectional view showing other examples of the concrete configuration of the information record medium by this invention.

[Drawing 4] It is the sectional view showing other examples of the concrete configuration of the information record medium by this invention.

[Drawing 5] It is the sectional view showing other examples of the concrete configuration of the information record medium by this invention.

[Drawing 6] It is the sectional view showing other examples of the concrete configuration of the information record medium by this invention.

[Description of Notations]

1 11 -- Base material

2 -- Magnetic-recording layer (a hologram layer or diffraction-grating layer)

3a, 14 -- The hologram formative layer or the diffraction-grating formative layer

3b, 13 -- Thin film layer

4 15 -- Protective layer

12 -- Magnetic-recording layer

[Translation done.]

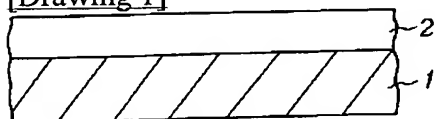
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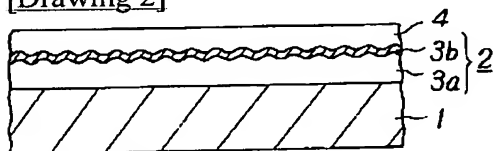
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DRAWINGS

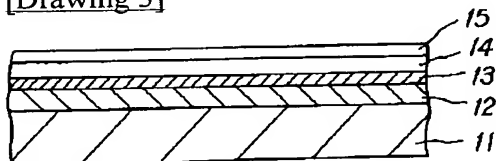
[Drawing 1]



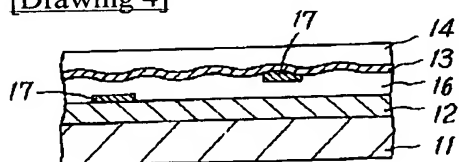
[Drawing 2]



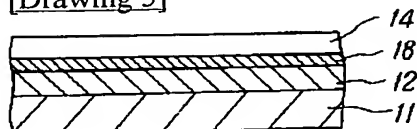
[Drawing 3]



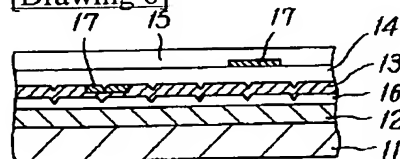
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]